What is Claimed is:

1. A multi-function machine tool comprising:

a main spindle which is rotatably disposed on the bed of the machine tool, and has workpiece attachment means for attaching a workpiece on the tip end thereof;

a tool rest main body which is disposed movably in relative terms in a first linear direction parallel to the axial line of said main spindle, and in a second linear direction perpendicular to said first linear direction;

a turning tool rest which is disposed on said tool rest main body, allows the mounting of a tool, and is disposed so that this tool rest can turn relative to said tool rest main body about a turning axis which has an axial line oriented in a direction that is perpendicular to both said first linear direction and said second linear direction; and

control means for controlling the rotational motion of said main spindle about the axial line of said main spindle, the turning motion of said turning tool rest about the axial line of said turning axis, and the relative motion of said main spindle and said tool rest main body in said first linear direction and said second linear direction;

wherein said control means can cause the turning motion of said turning tool rest about an arbitrary position that differs from the position of said turning axis by concurrently and synchronously causing a turning motion of said turning tool rest about said turning axis, and a circular-arc motion

based on the relative motion of said tool rest main body in said first linear direction and said second linear direction.

2. The multi-function machine tool according to claim 1, wherein said tool rest main body is disposed movably relative to said bed in said first linear direction and said second linear direction.

3. The multi-function machine tool according to claim 1, wherein said control means can accomplish the machining of helical grooves in said workpiece by causing a rotational motion of said workpiece about the axial line of said main spindle concurrently and in synchronization with said turning motion and said circular-arc motion.

4. The multi-function machine tool according to claim 3, wherein a plate-form bite as a tool that performs the machining of said helical grooves can be mounted on said turning tool rest.

5. The multi-function machine tool according to claim 3, wherein

a turning tool that performs turning on said workpiece can be mounted on said turning tool rest,

and said control means can perform said helical groove machining and said turning of said workpiece as a continuous process.

6. The multi-function machine tool according to claim 5, wherein said turning tool rest comprises at least a first mounting part which detachably mounts a tool that performs

said helical groove machining, and a second mounting part which detachably mounts a turning tool that performs said turning.

7. The multi-function machine tool according to claim 4, wherein a milling tool that performs rough machining of said helical grooves can be mounted on said turning tool rest.

8. The multi-function machine tool according to claim 7, wherein

said turning tool rest comprises a rotatable tool main spindle,

a tool mounting part is disposed on the tip end portion of said tool main spindle,

and said tool mounting part is capable of mounting said milling tool and said plate-form bite.

9. the multi-function machine tool according to claim 8, wherein said tool mounting part comprises rotation regulating means that regulate the rotation of said plate-form bite about said tool main spindle when said plate-form bite is mounted.

10. The multi-function machine tool according to claim 1, wherein

said workpiece attachment means can attach said workpiece in a position that is separated by a specified distance from said main spindle toward the front on the axial line of said main spindle,

and said machine tool is devised so that interference of said turning tool rest with other members can be prevented by